

CLAIMS

WHAT IS CLAIMED IS:

1. A surface modified enzyme comprising an enzyme genetically engineered to include a stabilizing group at the N-terminus, which stabilizing group is used to immobilize the enzyme onto a polymerized vesicle or inorganic surface.

2. The surface modified enzyme according to claim 1 wherein the stabilizing group is selected from the group consisting of histidine and polyhistidine.

*Sur a8* 3. A method for stabilizing enzymes comprising:  
genetically engineering an enzyme to include a stabilizing amino acid substitution;  
copolymerizing an amphiphile containing a salt selected from the group consisting of metal salts of iminodiacetic acid, nitrilotriacetic acid, and mixtures thereof with other polymerizable amphiphiles to form vesicles;  
binding the genetically engineered enzyme to the salts on the outer surface of the vesicles.

4. The method according to claim 3 wherein the metal salts are selected from the group consisting of copper, nickel, cobalt, and zinc salts.

*Sur a9* 5. The method according to claim 3 wherein the stabilizing amino acid is selected from the group consisting of histidine or polyhistidine.

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2 6. The method according to claim 3 wherein the enzyme is thioesterase.

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4 7. The method according to claim 3 wherein the salt is a metal salt of iminodiacetic  
5 acid.

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7 8. The method according to claim 3 wherein the salt is a metal salt of nitrilotriacetic  
8 acid.

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10 *See claim 9* 9. A method for stabilizing enzymes comparing:  
11 genetically engineering an enzyme to include a stabilizing amino acid substitution;  
12 attaching said stabilized enzyme to salt groups selected from the group consisting of  
13 metal salts of iminodiacetic acid, metal salts of nitrilotriacetic acid, and mixtures thereof on  
14 the surface of a particular inorganic carrier.

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16 10. The method according to claim 9 wherein the metal salts are selected from the  
17 group consisting of copper, nickel, cobalt, and zinc salts.

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19 *See all* 11. The method according to claim 7 wherein the carrier is a metal oxide ceramic  
20 particles that can be formed in the Stober process starting with a metal alkoxide precursor.

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22 12. The method according to claim 9 wherein the metal oxide particles are selected

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PATENT APPLICATION

1 from the group consisting of silica, alumina, baria, titania, and gircinia.

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2 13. The method according to claim 9 wherein the salt groups are metal salts of  
3 iminodiacetic acid.

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5 14. The method according to claim 9 wherein the salt groups are metal salts of  
6 nitrilotriacetic acid.

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